



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 :  B05C 17/005		A1	(11) International Publication Number: <b>WO 92/20460</b>
			(43) International Publication Date: 26 November 1992 (26.11.92)
(21) International Application Number: PCT/GB92/00813 (22) International Filing Date: 5 May 1992 (05.05.92)		<b>Published</b> <i>With international search report.</i>	
(30) Priority data: 9109717.0 3 May 1991 (03.05.91) GB			
(71)(72) Applicant and Inventor: PENN, Laurence, Richard [GB/GB]; 21 Woodcock Street, Burton Latimer, Kettering, Northamptonshire NN15 5LY (GB).			
(74) Agent: FRANKLAND, Nigel, H.; Forrester Ketley & Co, Forrester House, 52 Bounds Green Road, London N11 2EY (GB).			
(81) Designated States: AT (European patent), AU, BE (European patent), CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), GR (European patent), IT (European patent), JP, LU (European patent), MC (European patent), NL (European patent), SE (European patent), US.			
<b>(54) Title:</b> IMPROVEMENTS IN OR RELATING TO A DISPENSER FOR LIQUID AND A CONTAINER FOR USE WITH THE DISPENSER			
<b>(57) Abstract</b> <p>A dispenser (10) for a liquid comprises a pump (12, 14) which has an inlet (22) and an outlet (17). The inlet (22) of the pump (12, 14) is connected to a container (28) which contains the liquid to be dispensed. The pump (12, 14) draws liquid from the container (28) and dispenses the liquid under pressure through an appropriate outlet. The container (28) is readily detachable from the pump (12, 14), and the container (28) is a flexible, collapsible container (28) adapted to collapse progressively as dispensed therefrom by the pump (12, 14).</p>			

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"Improvements in or relating to a dispenser for liquid and a container for use with the dispenser"

THIS INVENTION relates to a dispenser for use with liquid and a container for use with such a dispenser.

In this Specification the term "liquid" is used to mean a flowable material which may have a low viscosity or which may have a high viscosity. Indeed the viscosity may be extremely high so the liquid may be in the form of a paste or an extremely viscous component for a resin.

There are various industrial situations in which chemical liquids, having viscosities within a wide range, are required to be stored, transported and subsequently be made available for use from drums and packages. If the liquids are supplied in drums, a device is required to transfer the liquid from the drum to the point at which the liquid is to be used, such as a pump or the like. If the liquid is supplied in a package, such as a cartridge, it is often appropriate to use a hand-operated gun to dispense the liquid from the cartridge, such as a so-called "caulking" gun.

In many cases, after the liquid has been withdrawn from a drum or cartridge, by utilising a pump or a "caulking" gun the drum or cartridge may contain a residue of the liquid initially present. This may present a cleaning and/or disposal problem, particularly if the

liquid is one which tends to pollute the environment or which is toxic. It has been proposed, in connection with drums, to use a removable liner, but even if such a removable liner is used the liner itself presents a further disposal or cleaning problem.

Whilst drums are often re-used, because of the cost of manufacturing such drums, and the fact that they are used in an industrial environment making it possible to return the drums to the original supplier for re-use, cartridges, such as used with "caulking" guns are almost invariably discarded after use. This again presents disposal problems. Whilst it may be possible to re-fill some cartridges, it is often the case that the liquid contained within the cartridges is such that when it is exposed to the atmosphere a chemical reaction occurs, and this makes it impracticable to seek to re-fill the cartridge.

It is among the objects of the invention to provide a dispenser incorporating a re-usable container, and a re-usable container for such a dispenser.

According to one aspect of this invention there is provided a dispenser for a liquid comprising a pump having an inlet and an outlet, the inlet being connected to a container which contains the liquid, the pump being arranged to draw the liquid from the container and to dispense the liquid under pressure from the outlet of the pump, the container being readily detachable from the pump, wherein the container is a flexible collapsible container adapted to collapse progressively as liquid is dispensed therefrom by the pump.

Preferably said container has side walls of bellows-like or concertina-like construction, the side walls thus being a corrugated, flexible peripheral wall.

Conveniently the said pump comprises a piston reciprocable in a cylindrical bore in which it is of a close sliding fit, a discharge outlet at one end of said bore having a one-way valve associated therewith to allow discharge of liquid from said cylindrical bore via said outlet but to prevent the passage of liquid from said outlet to said cylindrical bore, said inlet for liquid communicating with said cylindrical bore via an opening in a side wall of said bore at a location spaced from said outlet, whereby liquid may be forced from said bore out of said outlet by said cylindrical rod during a dispensing stroke in which the rod is moved along said bore towards said outlet whilst the periphery of said rod closes off said opening and whereby during a recovery stroke, in which said rod is moved in the opposite direction, a vacuum is created in said cylindrical bore between said outlet and the adjacent end of the rod until the rod uncovers said opening, allowing liquid from said container to pass under externally applied pressure into said cylinder.

This piston may be in the form of a cylindrical rod or may be in the form of a piston head driven by a rod.

According to another aspect of this invention there is provided a flexible collapsible container for a dispenser according to Claim 1, the container comprising a neck portion adapted to be releasably connected to the pump and flexible side walls adapted to collapse when liquid is withdrawn from the container.

Preferably the side walls of the container are of bellows-like or concertina-like construction, the container thus presenting a corrugated, flexible side wall.

This invention also covers such a container containing liquid and having a detachable sealing closure which seals the container.

In accordance with a further aspect this invention provides a flexible collapsible re-usable container, containing a quantity of liquid sensitive to air exposure, the liquid being sealingly contained in the container with the exclusion of air, the container having a detachable sealing closure, the container being formed of a flexible material so that the container is adapted to collapse progressively as liquid is pumped out of the container, the container being adapted to be re-filled with liquid for re-use.

In preferred embodiments of the invention, a reusable container for flowable products comprises a sealable and collapsible plastic bottle-type package or container of bellows-like configuration produced by a moulding process such as blow moulding or injection moulding or by fabrication, with the material of construction being suitable for chemical containment and preferably of recyclable or biodegradable form. The volume of the package or container can readily be increased or decreased through the action of the bellows. An internally facing integral plunger may be formed at one end of the container to occupy the space defined within the collapsed corrugated wall of the container as the container is collapsed. The expansion or compression of the container may be through pressure or vacuum exerted on the container inside or outside with or without contents. The container in the

preferred embodiments can be sealingly connected, in a readily detachable manner, with an inlet portion of a transfer or metering pump or pressurised container for the purpose of filling the container and can likewise be detachably connected, sealingly, to a transfer or metering pump in order to transfer, meter or dispense the contents. Such containers may be made in various sizes, and may, for example, have capacities, when filled, ranging from 55 gallons or more to 1/10th gallon or less. The containers may be used with various forms of dispensing or metering apparatus from hand-held and portable devices to stationary, metering or dispensing installations.

In preferred embodiments the containers are intended to be re-used, the end user re-sealing such containers after emptying them and returning the empty containers for refilling, preferably and advantageously, in a collapsed and reduced volume state. In this way the consumption of natural resources, energy expenditure and pollution involved in the manufacture of such containers is reduced, as is the problem of disposing of empty containers.

An embodiment of the invention is described below by way of example with reference to the accompanying drawings in which

FIGURE 1 is a perspective view showing a dispensing apparatus embodying the invention,

FIGURE 2 is a view in longitudinal section of the apparatus of Figure 1,

FIGURE 3 is a schematic detailed view of a variant, showing a collapsible container in expanded condition,

FIGURE 4 is a view corresponding to Figure 3 but showing the container in a collapsed condition, and

FIGURE 5 is a view in axial section of an alternative form of container.

The apparatus of Figure 1 is intended to meter, in a predetermined proportion, respective interactive fluid components of a two-part synthetic resin (e.g. of an epoxy adhesive or filler) to a common outlet 8, to which, in use, is fixed a static mixing nozzle (not shown) adapted to mix said components thoroughly together and discharge the mixture to the location where it will harden or set.

Referring to Figures 1 and 2, the apparatus comprises a metal body 10 in which is formed, for each resin component, a respective cylindrical bore 12 in which a respective piston 14 is sealingly slidable. The piston 14 takes the form of an elongate cylindrical rod which, at its rear end (not shown) is connected with an actuating mechanism whereby the piston 14 may be reciprocated longitudinally in the cylinder 12, for example by manual operation of a trigger (not shown). At its forward end, each bore 12 is closed by a respective end wall 16 having a central outlet port 17 leading, via a respective one way valve, (check valve) 18 to a discharge passage 20. At a position spaced substantially rearwardly from the end wall 16 a respective inlet port 22 opens into the cylindrical wall of the respective bore 12. Each port 22 communicates with the interior of a respective collapsible container 28, via a mouth or neck of the container which is sealingly attached to a respective mounting formation indicated generally at 25, on the exterior of the body 10. Each container 28, as shown in axial section in Figure 2, has the general form of a

generally cylindrical bottle or jar, mounted in an inverted position on top of the body 10 so that its "base" is uppermost and its mouth or neck lowermost to engage the mounting formation 25. The container 28, as shown in Figure 2, has the overall form of a cylindrical plastics drum which is provided with peripheral corrugations 30 facilitating axial collapse and expansion of the container by folding or unfolding of the corrugations after the fashion of a concertina or a bellows. The containers 28 are readily detachable secured to the body 10 in any convenient manner. For example, each container may have a screw threaded neck screwed onto or into a corresponding screw threaded part of the formation 25 or may be arranged to be a sealing push-fit on or in the formation 25 with releasable retaining means being provided on the body for engaging with a flange formed around the neck of the container.

It will be appreciated that when a container 28 is in a collapsed condition, (Figure 4) the individual corrugations take the form of substantially annular plates stacked on one another, which thereby define together a cylindrical shell of finite thickness corresponding to the radial extent of such annular plates. Furthermore, due to the finite thickness of the plastics material forming the container, and the consequent finite axial length of the container in a collapsed condition, there is a cylindrical space of appreciable axial length defined within said corrugations in said collapsed condition, which, in the absence of any remedial feature, would be a "dead space" which would retain a significant quantity of the flowable substance, even when the container was completely collapsed.

In order to eliminate this "dead space", the mounting formation includes a cylindrical projection or boss 26, which fits snugly within the collapsed container, as shown in Figure 3, to occupy this "dead space". Thus, as the container collapses, the boss 26 serves to displace from the region within the corrugations, the major part of any fluid product. As an alternative to the provision of such a cylindrical projection and boss, or in addition thereto, a central projection 27 into the container may be formed in the base of the inverted container as illustrated in Figure 5.

In operation of the apparatus illustrated, each piston 14 is moved simultaneously forwardly, for example by an actuating mechanism common to both pistons, from the position shown in Figure 2 towards the respective end wall 16 so that, once each piston 14 has advanced sufficiently to close off, from the respective cylinder 12, the respective port 22, the fluid within the respective cylinder 12 is expelled, via the respective port 17 and one-way valve 18, to the respective discharge passage 20. When the pistons 14 have reached the limit of their forward strokes, at which the forward ends of the pistons are closely adjacent the respective end walls 16, the pistons 14 are forcibly retracted creating, since the one-way valves 18 are now closed, a vacuum within each cylinder 12, until the forward ends of the pistons 14 disclose the ports 22 whereupon, by reason of the atmospheric pressure acting upon the containers 28, a further charge of the fluid is caused to flow from within each container 28 into the respective bore 12 to eliminate the vacuum, thereby placing a fresh charge of the fluid within the respective cylinder 12 in preparation for the next forward stroke of the pistons 14. In this way, a predetermined quantity of the respective fluid is dispensed

to each passage 20 at each stroke of the pistons, whilst the fluids within the cylinders 28 and the cylinders 12 are kept out of contact with the air. During repeated strokes of the pistons 14, the containers 28 progressively collapse, i.e. diminish in axial length as the corrugations 30 become more closely folded, until the position shown in Figure 4 is reached. In the embodiment illustrated, the discharge passages 20 from the two cylinders 12 unite downstream of the valves 18 in the common outlet 9.

The containers 28 are preferably supplied, in the filled condition, with removable and replaceable sealing caps or closures fitted over the necks and mouths thereof, the intention being that, when a container is fully emptied, it will be quickly detached from the mounting formation 25 on the body 10, the closure cap quickly reapplied to exclude air from within the container and minimise air-curing or degradation of the residue of product within the container and the container is returned to the manufacturer in this condition, for re-filling, after a cleaning step, if necessary.

Whilst the invention has been described with reference to an embodiment in which the walls of the container are of bellows-like or concertina-like construction, it is to be appreciated that the invention is not restricted to containers as having this particular form. Indeed, the invention may embody a container in the form of a totally flexible bag. Such a totally flexible bag may, for sake of ease of handling, be retained within a rigid outer housing, so that the bag collapses within the housing as liquid is withdrawn from the bag, and the bag can then subsequently be re-filled for re-use.

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CLAIMS:

1. A dispenser for a liquid comprising a pump having an inlet and an outlet, the inlet being connected to a container which contains the liquid, the pump being arranged to draw the liquid from the container and to dispense the liquid under pressure from the outlet of the pump, the container being readily detachable from the pump, wherein the container is a flexible collapsible container adapted to collapse progressively as liquid is dispensed therefrom by the pump.
2. A dispenser according to Claim 1 wherein said container has side walls of bellows-like or concertina-like construction, the side walls thus being a corrugated, flexible peripheral wall.
3. A dispenser according to Claim 1 or Claim 2 wherein the said pump comprises a piston reciprocable in a cylindrical bore in which it is of a close sliding fit, a discharge outlet at one end of said bore having a one-way valve associated therewith to allow discharge of liquid from said cylindrical bore via said outlet but to prevent the passage of liquid from said outlet to said cylindrical bore, said inlet for liquid communicating with said cylindrical bore via an opening in a side wall of said bore at a location spaced from said outlet, whereby liquid may be forced from said bore out of said outlet by said cylindrical rod during a dispensing stroke in which the rod is moved along said bore towards said outlet whilst the periphery of said rod closes off said opening and whereby during a recovery stroke, in which said rod is moved in the

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opposite direction, a vacuum is created in said cylindrical bore between said outlet and the adjacent end of the rod until the rod uncovers said opening, allowing liquid from said container to pass under externally applied pressure into said cylinder.

4. A dispenser according to Claim 3 wherein the piston is in the form of a cylindrical rod.

5. A dispenser according to Claim 3 wherein the piston is in the form of a piston head driven by a rod.

6. A flexible collapsible container for a dispenser according to Claim 1, the container comprising a neck portion adapted to be releasably connected to the pump and flexible side walls adapted to collapse when liquid is withdrawn from the container.

7. A container according to Claim 6 wherein the side walls of the container are of bellows-like or concertina-like construction, the container thus presenting a corrugated, flexible side wall.

8. A container according to Claim 6 or 7, containing liquid and having a detachable sealing closure which seals the container.

9. A flexible collapsible re-usable container, containing a quantity of liquid sensitive to air exposure, the liquid being sealingly contained in the container with the exclusion of air, the container having a detachable sealing closure, the container being formed of a flexible material so that the container is adapted to collapse progressively as liquid is pumped out of the container, the

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container being adapted to be re-filled with liquid for re-use.

10. A dispenser for liquid substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

11. A collapsible container substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

12. Any novel feature or combination of features described herein.

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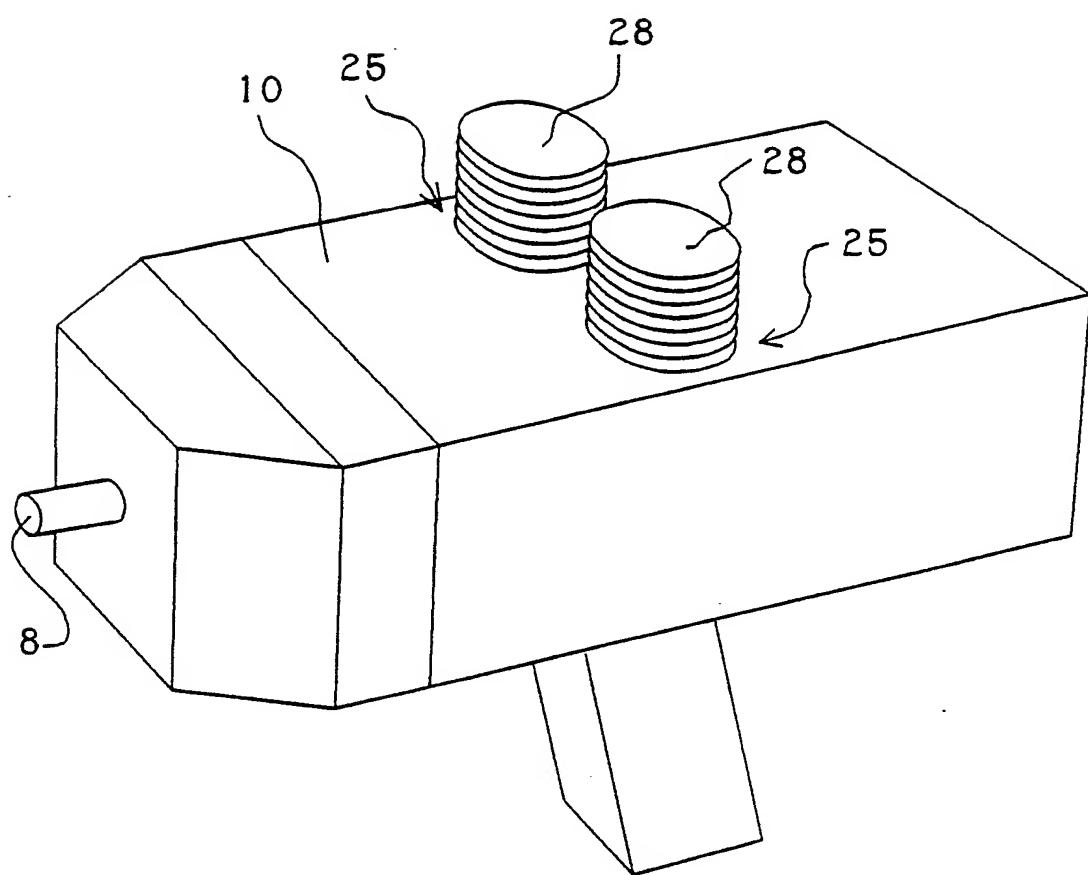
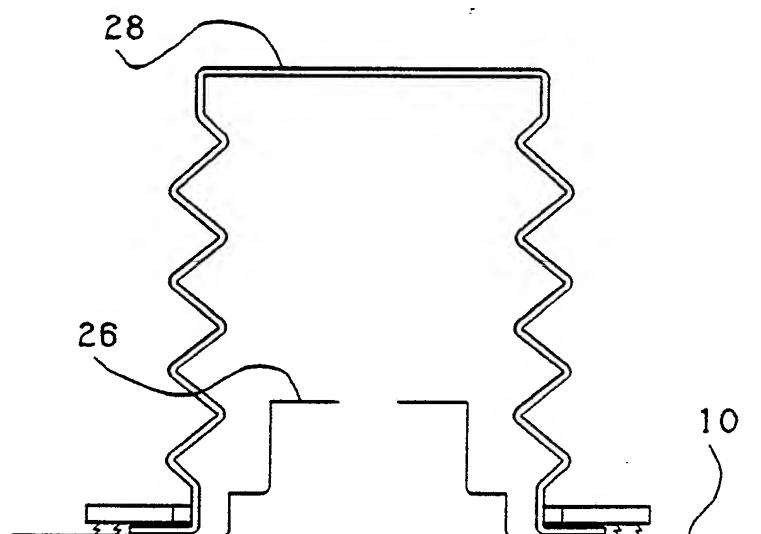
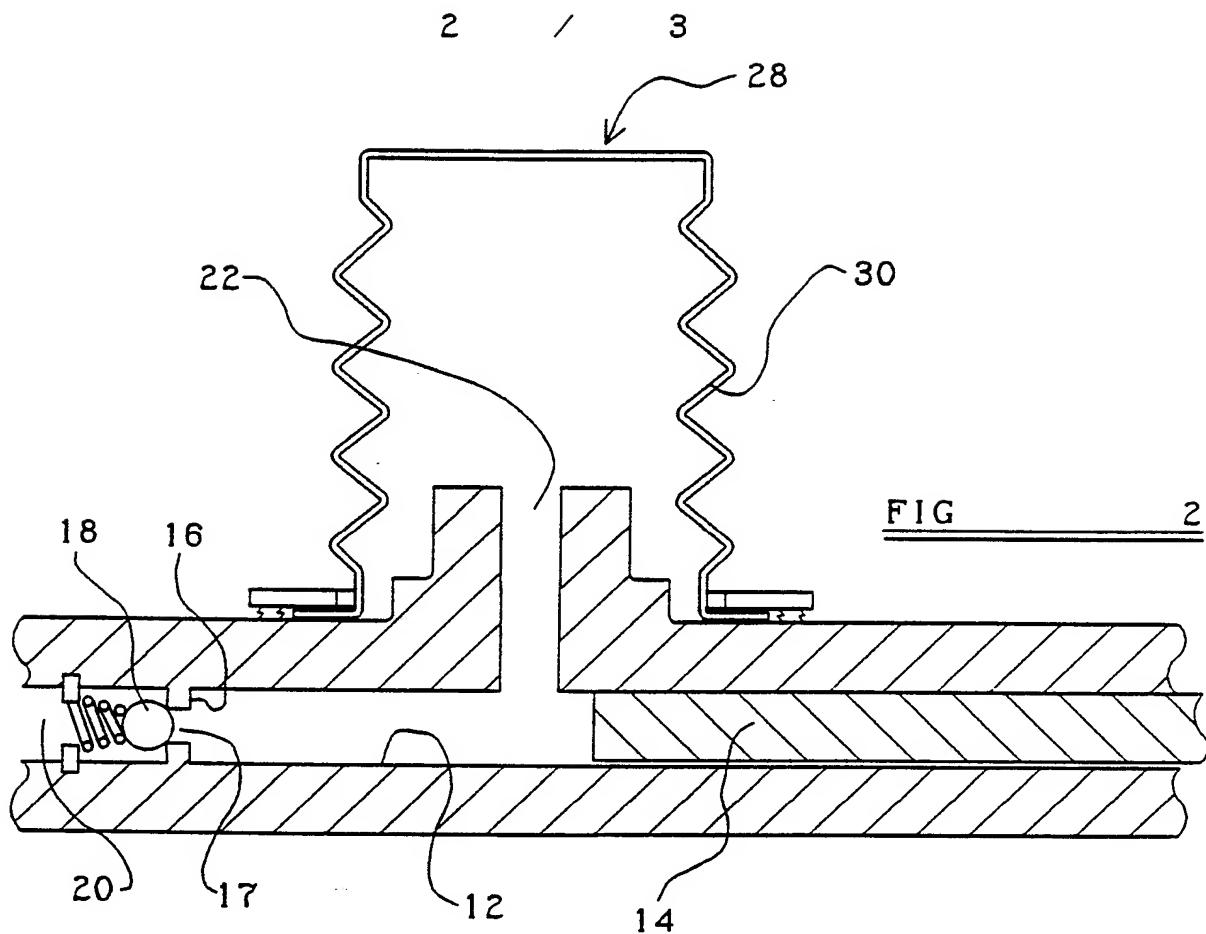
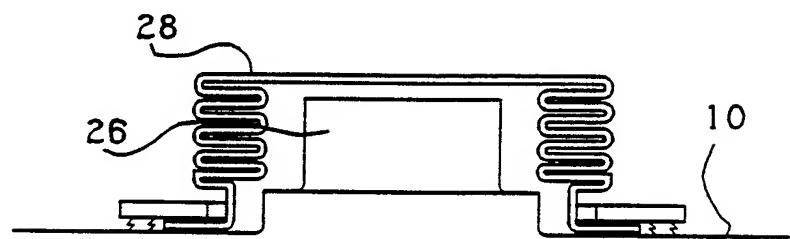
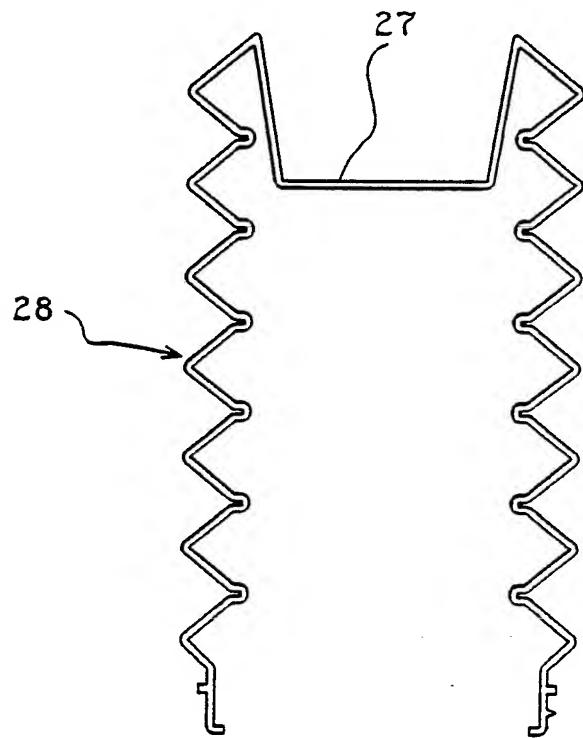


FIG 1



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FIG 4FIG 5

## INTERNATIONAL SEARCH REPORT

International Application No.

PCT/GB 92/00813

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)<sup>6</sup>

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.C1. 5 B05C17/005

## II. FIELDS SEARCHED

Minimum Documentation Searched<sup>7</sup>

Classification System	Classification Symbols
Int.C1. 5	B05C ; B05B

Documentation Searched other than Minimum Documentation  
to the Extent that such Documents are Included in the Fields Searched<sup>8</sup>III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup>

Category <sup>10</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
X	DE,U,8 709 845 (REINER CHEMISCHE FABRIK GMBH & CO) 10 September 1987 see page 5, line 18 - line 25 see page 7, line 13 - line 28 ---	1,3-6, 8-12
X	DE,A,3 440 893 (REINER CHEMISCHE FABRIK GMBH & CO) 22 May 1986 see page 10, line 18 - line 26 ---	1,3-6, 8-12
X	GB,A,2 083 142 (PFEIFFER KUNSTSTOFF GMBH & CO KG) 17 March 1982 see page 1, line 116 - line 124; figures 2,3 ---	1,2,6,7

<sup>6</sup> Special categories of cited documents :<sup>10</sup>

- "A" document defining the general state of the art which is not considered to be of particular relevance
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<sup>7</sup> later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention<sup>8</sup> document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step<sup>9</sup> document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art<sup>10</sup> & document member of the same patent family

## IV. CERTIFICATION

Date of the Actual Completion of the International Search

30 JULY 1992

Date of Mailing of this International Search Report

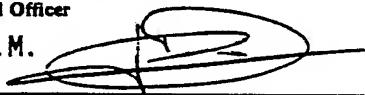
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ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO. GB 9200813  
SA 58877

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information. 30/07/92

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-U-8709845	10-09-87	None	
DE-A-3440893	22-05-86	None	
GB-A-2083142	17-03-82	DE-A- 3033392 CH-A- 652372 FR-A,B 2489791	29-04-82 15-11-85 12-03-82